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10/509,996	10/05/2004	Tobias Tynderfeldt	4147-90	4653

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EXAMINER	
NGUYEN, LEON VIET Q	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/509,996	TYNDERFELDT, TOBIAS	
	Examiner	Art Unit	
	Leon-Viet Q. Nguyen	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 February 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-17 and 19-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9-17 and 19-29* is/are rejected.

7)☒ Claim(s) *22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10/5/04* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/28/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. This office action is in response to communication filed on 2/28/07. Claims 8 and 18 have been canceled. Claims 21 - 29 have been added. Claims 1 - 7, 9 - 17, and 21 - 29 are pending on this application.

2. Applicant's amendment overcomes the following objection/rejection:

   a. Rejection of claim 14 under 35 USC 112.

3. Applicant's arguments with respect to claims 1-7, 8-17, and 19-20 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

4. Claim 22 objected to because of the following informalities:

   b. Re claim 22, "The system" lacks proper antecedent basis.

   Appropriate correction is required.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 3 the phrase "for instance" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-7, 9-17, and 19-29 are rejected under 35 U.S.C. 102(e) as being anticipated by Lindskog et al (US20060115031).

Re claim 1, Lindskog discloses a method for avoiding inter-layer inter-symbol interference, comprising:

using a diagonally layered multi-antenna transmission utilizing a number of multiple layers (a first layer corresponding to antenna 11 and a second layer

corresponding to antenna 12 in fig. 7), each layer including a different sequence of symbols ($d_1(t)$ and $-d_2^*(N-t)$ from antenna 11 and $d_2(t)$ and $d_1^*(N-t)$ from antenna 12 in fig. 7);

dividing symbols of each layer into a first number of parts of layers, the number being a multiple of the number of layers (fig. 7, the layers corresponding to antennas 11 and 12 are divided into a first and second block);

associating the parts of layers to a second number of transmit antennas such that all antennas transmit an equal number of parts of each layer (¶0021, fig. 7, each antenna transmitting two parts);

inserting known symbols between the parts to each transmit antenna (¶0060, fig. 7), a number of known symbols being at least as many as a number of symbol spaced channel taps minus one (¶0061, two training symbols per channel block and it is well known that there would be one channel tap per channel, ¶0063) seen by a receiver to avoid inter-layer inter-symbol interference.

Re claim 2, Lindskog discloses a method according further comprising: inserting the number of known symbols (fig. 7, the at least nh known symbols) at the border (fig. 7, the know symbols inserted in between the blocks) between the multiple subsequences of the different layers (fig. 7, the first and second blocks are interpreted as the subsequences) with at least as many as an expected channel memory for a channel observed by a receiver (¶0061, two training symbols per channel block and it is well known that there would be one channel tap per channel, ¶0063. As disclosed in

applicant's specification, channel memory refers to the number of channel taps minus one).

Re claim 3, Lindskog discloses a method according further comprising: inserting the known symbols at the borders between the different layers (fig. 7) and also using inserted known symbols also for purposes such as for instance channel estimation or similar purposes (¶0061).

Re claim 4, Lindskog discloses a method further comprising: letting the first number of multiple subsequences of the layers having an equal size (fig. 7).

Re claim 5, Lindskog discloses a method further comprising: making the known symbols to constitute a training sequence (¶0061).

Re claim 6, Lindskog discloses a method wherein a system having a first and a second transmit antenna (fig. 7), and a burst structure containing a training sequence in the middle of a burst and with data fields to either side of the training sequence (fig. 7, the r_1 and r_2 blocks being data fields and the two blocks combined to create one frame or burst), the method further comprises: transmitting a layer one in a left data field and a layer two in a right data field from the first antenna (fig. 7, $d_1(t)$ is layer one and $d_2^*(N-t)$ is layer two), while transmitting from the second antenna the layer two in the left data field and the layer one in the right data field (fig. 7, $d_2(t)$ is layer one and $d_1^*(N-t)$ is layer

two) and from each antenna separating the two layers by the known training sequence (fig. 7) to thereby avoid inter-layer inter-symbol interference.

Re claim 7, Lindskog discloses a method further comprising: adaptively changing a transmitter algorithm used between layering over one or several antennas depending on a modulation scheme (¶0023), and/or a code rate of an outer channel code.

Re claim 9, Lindskog discloses a method further comprising:

dividing a transmit antenna array into sub-sets of transmit antennas, each sub-set containing an arbitrary number of transmit antennas (¶0009, the system comprising for a first and second spaced antenna within one group);

dividing the layers into sub-sets of layers, each sub-set of layers corresponding to a sub-set of transmit antennas (¶0023);

diagonally layering the layers within a sub-set, while not permitting layering across different transmit antenna sub-sets (¶0064, ¶0070, it is well known in the art that in diagonally layered space-time architecture symbols are fed to antennas in turn).

Re claim 10, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 9. Furthermore, Lindskog discloses setting up a transmit antenna arrangement constituting an even number of individual antennas, the transmit antenna array being divided into sub-sets of two individual antennas (¶0009, ¶0070, dividing the group of transmit antennas into 2 groups).

Re claim 11, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 1. It would be inherent to have a system to perform the method as claimed.

Re claim 12, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 2.

Re claim 13, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 3.

Re claim 14, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 4.

Re claim 15, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 5.

Re claim 16, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 6.

Re claim 17, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 7.

Re claim 19, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 9.

Re claim 20, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 10.

Re claim 21, Lindskog discloses a method wherein each sequence of symbols is divided by separating the symbols into the first number of multiple sub-sequences (fig. 7, the symbols corresponding to antenna 11 separated in the first and second block) and introducing the known symbols at the border between the multiple sub-sequences of the different layers (fig. 7).

Re claim 22, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 10.

Re claim 23, Lindskog discloses an apparatus for avoiding inter-layer inter-symbol interference, comprising:

a diagonally-layered, multi-antenna transmitter including a number of multiple layers (a first layer corresponding to antenna 11 and a second layer corresponding to antenna 12 in fig. 7. ¶0064, it is well known in the art that in diagonally layered space-time architecture symbols are fed to antennas in turn with a delay in between), each

layer including a different sequence of symbols ($d_1(t)$ and $-d_2^*(N-t)$ from antenna 11 and $d_2(t)$ and $d_1^*(N-t)$ from antenna 12 in fig. 7),

wherein the different sequence of symbols corresponding to each layer is divided into a first number of multiple sub-sequences of layers, the first number of multiple sub-sequences of layers being a multiple of the number of multiple layers (fig. 7, the layers corresponding to antennas 11 and 12 are divided into a first and second block),

electronic circuitry (although not explicitly disclosed, it would be inherent for an apparatus to have electronic circuitry) configured to:

associate the multiple sub-sequences of layers to a second number of transmit antennas such that all antennas transmit an equal number of multiple sub-sequences of each layer (¶0021, fig. 7, each antenna transmitting two parts);

inserting known symbols between the parts to each transmit antenna (¶0060, fig. 7), a number of known symbols being at least as many as a number of symbol spaced channel taps minus one (¶0061, two training symbols per channel block and it is well known that there would be one channel tap per channel, ¶0063) seen by a receiver to avoid inter-layer inter-symbol interference.

Re claim 24, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 2. It would be inherent to have electronic circuitry within the apparatus as claimed.

Re claim 25, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 3.

Re claim 26, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 5.

Re claim 27, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 6.

Re claim 28, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 9.

Re claim 29, the claim limitations as recited have been analyzed and addressed in the above rejections with respect to claim 21.

Response to Remarks

Applicant argues that Lindskog does not disclose transmitting multiple different signals (Remarks page 12).

Examiner respectfully disagrees.

Lindskog discloses that a symbol stream d(t) is divided into two equal parts $d_1(t)$ and $d_2(t)$ (¶0021). Although $d_1(t)$ and $d_2(t)$ belong to the same signal, it is interpreted that each contain a different sequence of symbols since d(t) is divided in half. Lindskog

never discloses that $d_1(t)$ and $d_2(t)$ are the same. Referring to fig. 7, the two different symbols $d_1(t)$ and $d_2(t)$ are transmitted on antennas 11 and 12 respectively. Therefore it is interpreted that Lindskog transmit multiple different signals $d_1(t)$ and $d_2(t)$. Furthermore, antennas 11 and 12 also transmit time-reversed versions of $d_1(t)$ and $d_2(t)$. And although they are associated with their respective symbols, they are interpreted to be different.

Applicant argues, with reference to claim 1, that Lindskog fails to disclose each layer including a different sequence of symbols and that "the different sequence of symbols of each layer is divided into a first number of multiple sub-sequences of layers, the first number of multiple sub-sequences of layers being a multiple of the number of multiple layers" (Remarks page 13).

Examiner respectfully disagrees.

Referring to figure 7, it is interpreted that a first layer corresponds to antenna 11 and a second layer corresponds to antenna 12. As previously stated above, $d_1(t)$ and $d_2(t)$ contain different symbols and $d_1^*(N-t)$ and $-d_2^*(N-t)$ also contain different symbols. Therefore it is interpreted that the two layers contain different sequences of symbols. Also, it is interpreted that the layer corresponding to antenna 1 is divided into a first block and second block in fig. 7, with the two blocks being different sub-sequences of the layer. Since there are two layers, one corresponding to each antenna, and the first layer is divided into two blocks or sub-sequences, the first number of multiple sub-

sequences of the layers is considered to be a multiple of the number of multiple layers; Two being a multiple of two.

Applicant argues that Lindskog's object is to double the diversity while maintaining the same transmission capacity and applicant's invention almost doubles the transmission capacity without the risk of inter-layer ISI (Remarks page 13).

Although applicant never claims almost doubling transmission capacity, it is noted that Lindskog does disclose combining time-reversal space time block coding, was can handle ISI, with transmit delay diversity (¶0064). Furthermore Lindskog discloses that doubling the diversity, the range of the system can be increased or the capacity can be further increased (¶0065). This increase in capacity is interpreted to be almost double, as argued by applicant.

Applicant argues, with reference to claims 2-6 and 12-16, that the words channel "channel memory" are not mentioned in Li.

The previous rejection of claim 2-6 and 12-16 under 35 USC 103 have been withdrawn. However in light of the new rejection, the claims are deemed anticipated by Lindskog. As disclosed in applicant's specification, channel memory refers to the number of channel taps minus one. Channel taps are an inherent feature of transmit diversity systems.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leon-Viet Q. Nguyen whose telephone number is 571-270-1185. The examiner can normally be reached on monday-friday, alternate friday off, 7:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Leon-Viet Nguyen/

David C Payne

DAVID C. PAYNE
SUPERVISORY PATENT EXAMINER